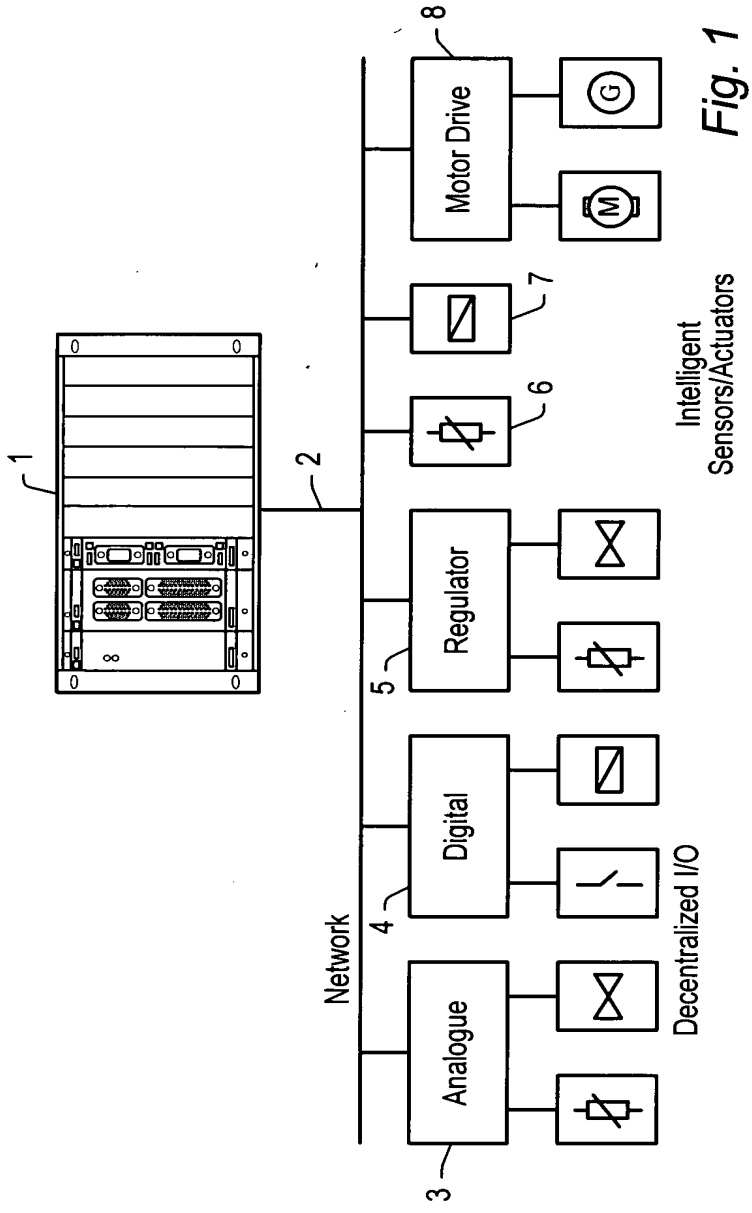


Fig. 1
(Prior Art)

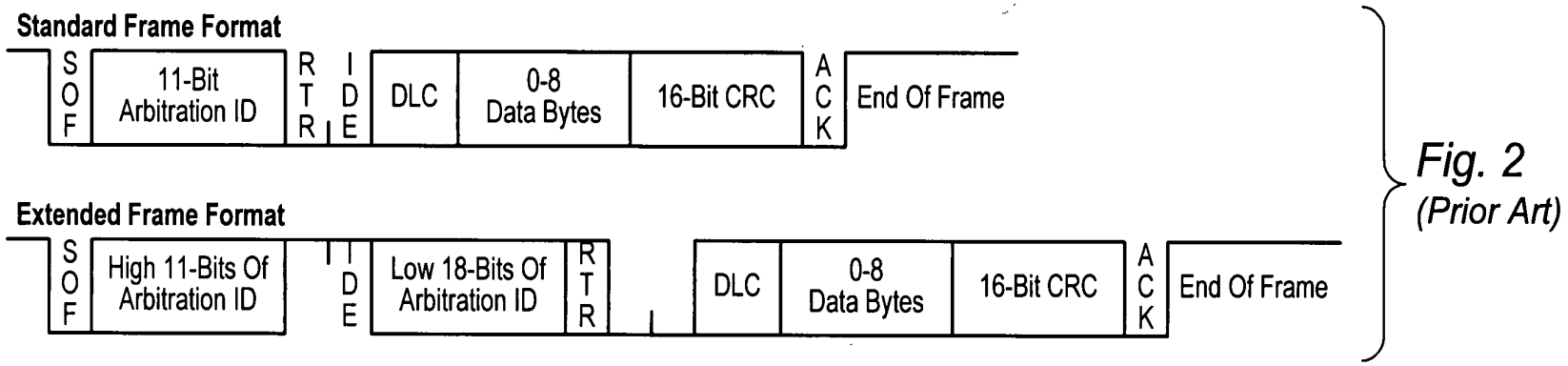


Fig. 2
(Prior Art)

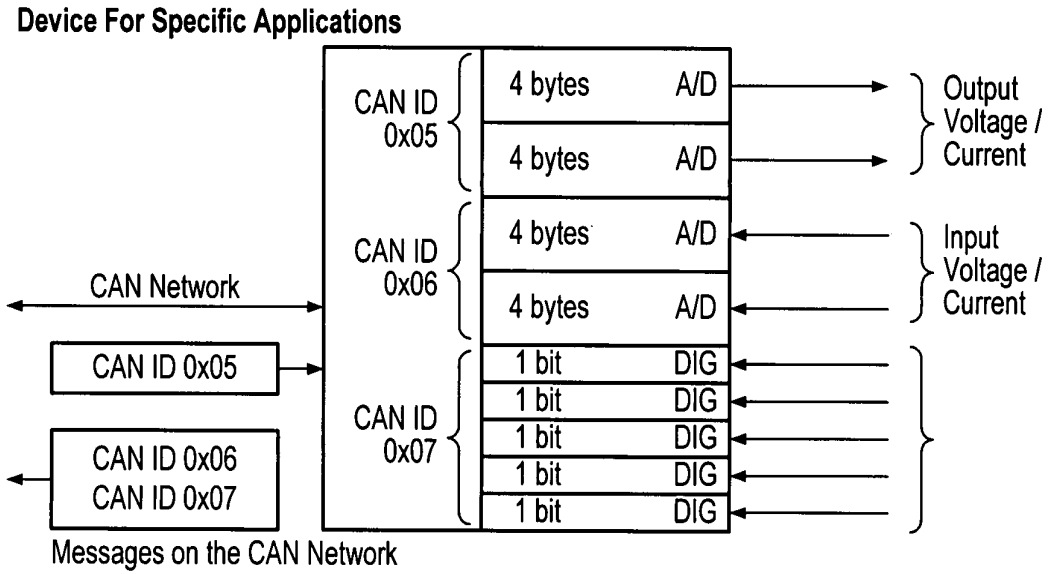


Fig. 3
(Prior Art)

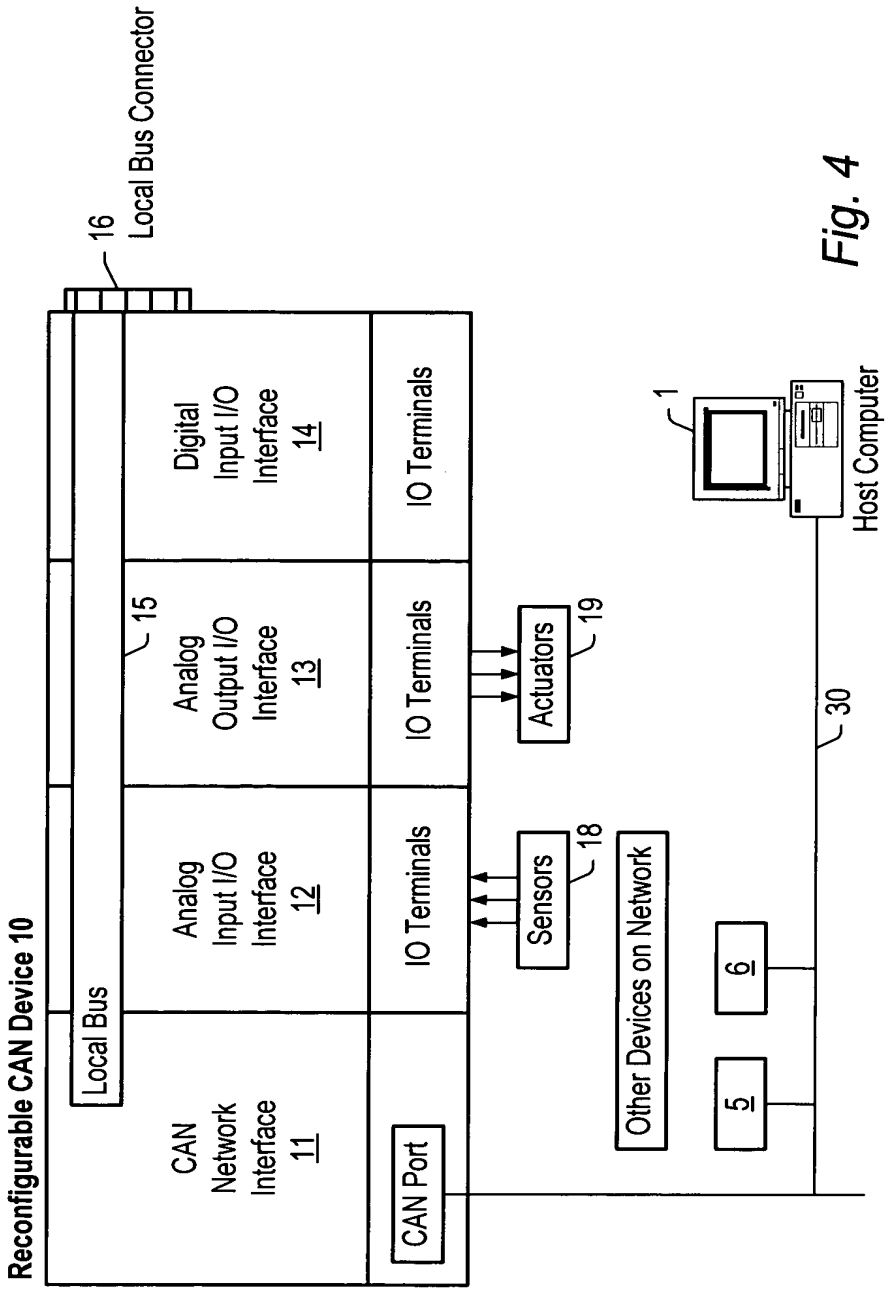

Reconfigurable CAN Device 10
CAN Network Interface 11
Local Bus
Analog Input I/O Interface 12
Analog Output I/O Interface 13
Digital Input I/O Interface 14
15
16
Local Bus Connector
CAN Port
IO Terminals
IO Terminals
IO Terminals
Sensors
18
Actuators
19
Other Devices on Network
5
6
30
1
Host Computer

Fig. 4

Example Reconfigurable CAN Device

CAN Network Interface Base Arbitration ID 0x300 20	Analog Input I/O Interface (AI) 21	Analog Output I/O Interface (AO) 22	Digital Input I/O Interface (DI) 23	Digital Output I/O Interface (DO) 24
	8 channels, 2 bytes per channel	8 channels, 2 bytes per channel	16 channels, 1 bit per channel	16 channels, 1 bit per channel

Fig. 5

Channel And Arbitration ID Scheme On Initialization

Arbitration ID	Bytes Used	Interface	Channels	Comment
0x300				Reserved for configuration response
0x301				Reserved for configuration request
0x302	8	AI	1 to 4	2 bytes / channel
0x303	8	AI	5 to 8	2 bytes / channel
0x304	8	AO	1 to 4	2 bytes / channel
0x305	8	AO	5 to 8	2 bytes / channel
0x306	2	DI	1 to16	1 bit / channel
0x307	2	DO	1 to16	1 bit / channel

Fig. 6

Channel And Arbitration ID Scheme After Modification (Arbitrary Example All Channels Used)

Arbitration ID	Bytes Used	Interface	Channels	Comment
0x300				Reserved for configuration
0x301				Reserved for configuration
0x305	5	AI, DI	1,2 from AI 8 from DI	2 bytes / channel from AI 1 bit / channel from DI
0x30A	7	AI, DI	3,4,5 from AI 8 from DI	2 bytes / channel from AI 1 bit / channel from DI
0x310	4	AO, DO	1 from AO 16 from DO	2 bytes / channel from AO 1 bit / channel from DO
0x312	6	AO	2,5,8 from AO	2 bytes / channel
0x31F	8	AO	3,4,6,7 from AO	2 bytes / channel
0x320	6	AI	6,7,8 from AI	2 bytes / channel from AI

Fig. 7

Graphical view of arbitration ID 0x305

Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	
AI-CH1	AI-CH1	AI-CH1	AI-CH1	AI-CH1	AI-CH1	AI-CH1	AI-CH1	Byte 0
AI-CH1	AI-CH1	AI-CH1	AI-CH1	AI-CH1	AI-CH1	AI-CH1	AI-CH1	Byte 1
AI-CH2	AI-CH2	AI-CH2	AI-CH2	AI-CH2	AI-CH2	AI-CH2	AI-CH2	Byte 2
AI-CH2	AI-CH2	AI-CH2	AI-CH2	AI-CH2	AI-CH2	AI-CH2	AI-CH2	Byte 3
DI-CH1	DI-CH2	DI-CH3	DI-CH4	DI-CH5	DI-CH6	DI-CH7	DI-CH8	Byte 4
								Byte 5
								Byte 6
								Byte 7

Fig. 8

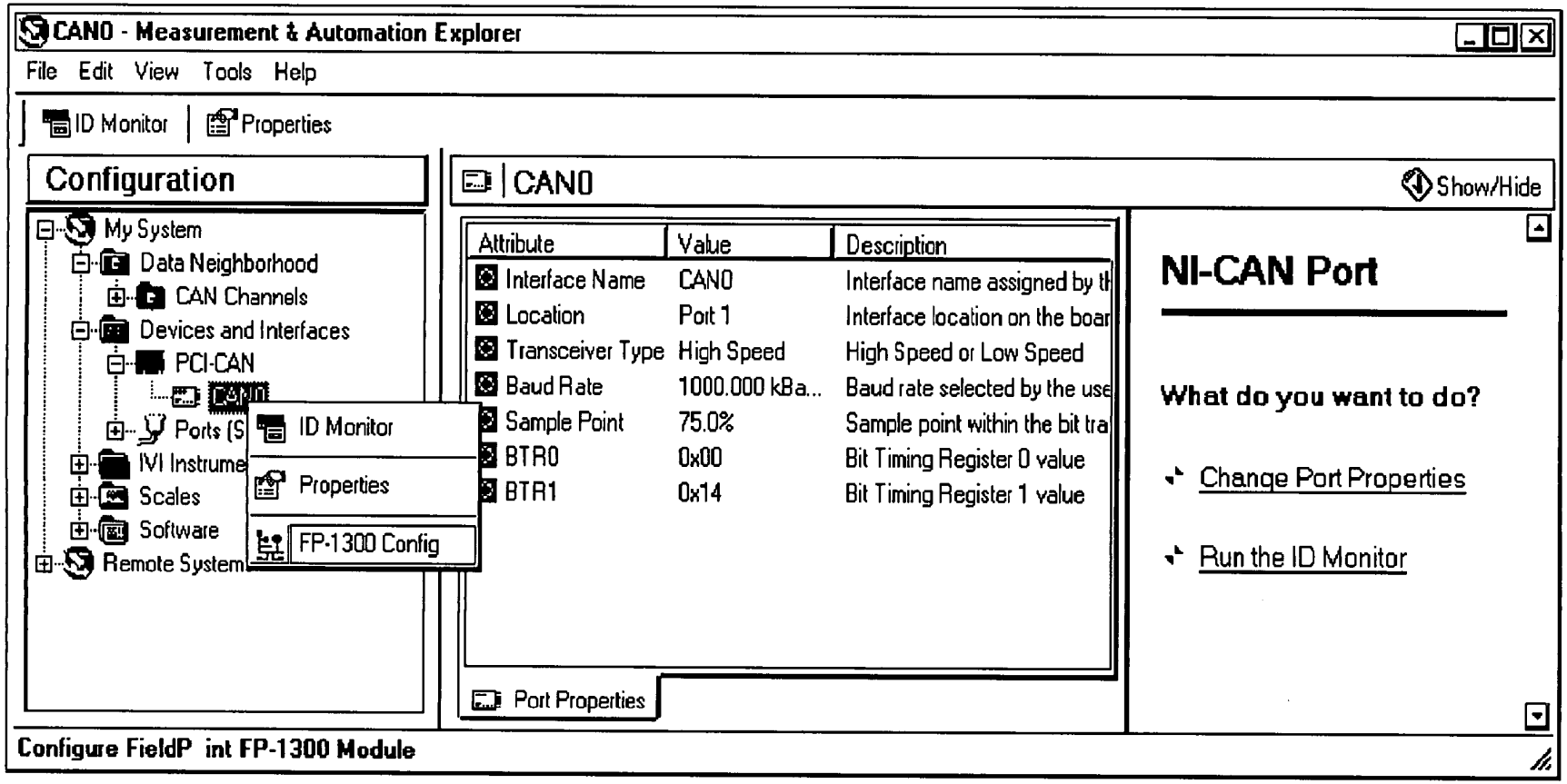

CAN0 - Measurement & Automation Explorer
File Edit View Tools Help
ID Monitor
Properties
Configuration
My System
Data Neighborhood
CAN Channels
Devices and Interfaces
PCI-CAN
Ports (S
IVI Instrume
Scales
Software
Remote System
ID Monitor
Properties
FP-1300 Config
CAN0
Show/Hide
Attribute
Value
Description
Interface Name
CAN0
Interface name assigned by th
Location
Port 1
Interface location on the boar
Transceiver Type
High Speed
High Speed or Low Speed
Baud Rate
1000.000 kBa...
Baud rate selected by the use
Sample Point
75.0%
Sample point within the bit tra
BTR0
0x00
Bit Timing Register 0 value
BTR1
0x14
Bit Timing Register 1 value
Port Properties
NI-CAN Port
What do you want to do?
Change Port Properties
Run the ID Monitor
Configure FieldP int FP-1300 Module

Fig. 9

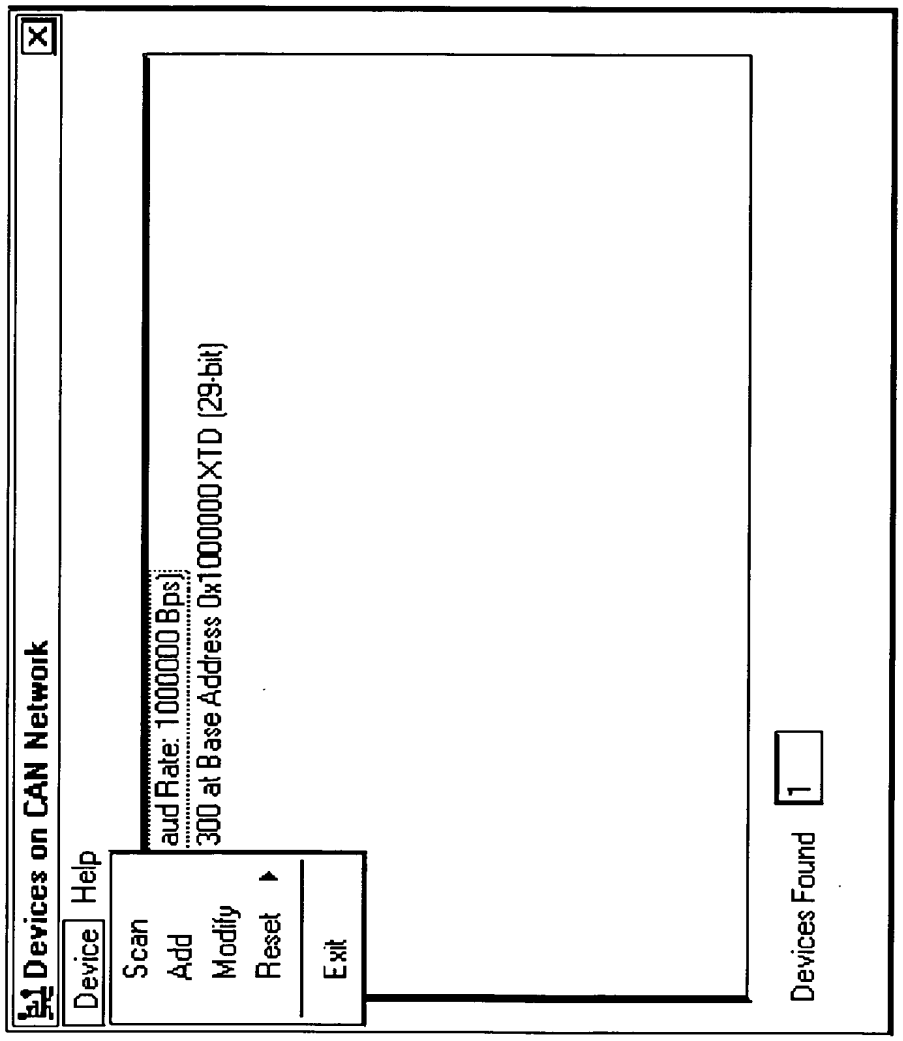

Devices on CAN Network
Device
Help
Scan
Add
Modify
Reset
Exit
aud Rate: 1000000 Bps)
300 at Base Address 0x1000000 XTD (29-bit)
Devices Found
1

Fig. 10

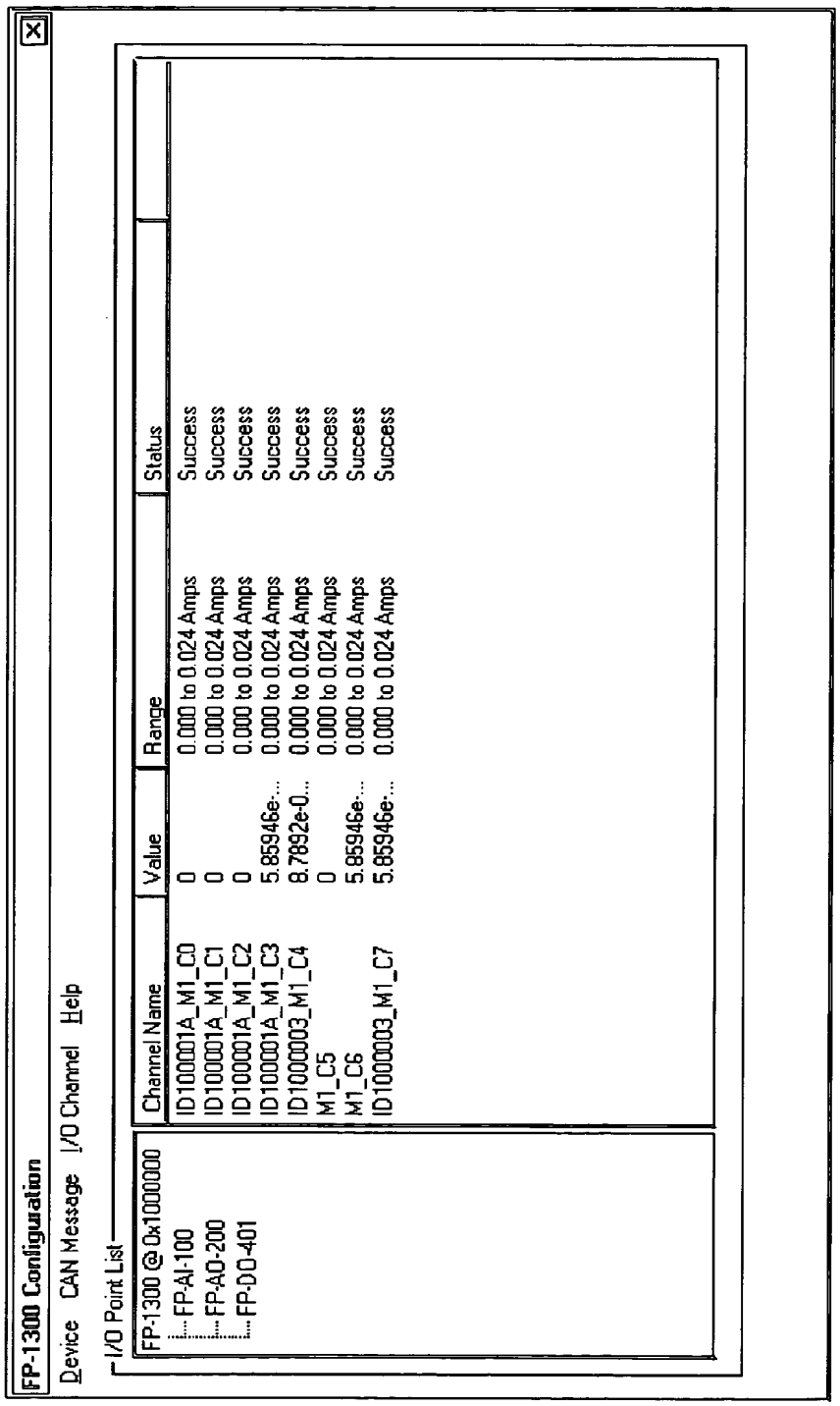

FP-1300 Configuration
Device CAN Message I/O Channel Help
I/O Point List
FP-1300 @ 0x1000000
FP-AI-100
FP-AO-200
FP-DO-401
Channel Name
Value
Range
Status
ID100001A_M1_C0
0
0.000 to 0.024 Amps
Success
ID100001A_M1_C1
0
0.000 to 0.024 Amps
Success
ID100001A_M1_C2
0
0.000 to 0.024 Amps
Success
ID100001A_M1_C3
5.85946e-...
0.000 to 0.024 Amps
Success
ID1000003_M1_C4
8.7892e-0...
0.000 to 0.024 Amps
Success
M1_C5
0
0.000 to 0.024 Amps
Success
M1_C6
5.85946e-...
0.000 to 0.024 Amps
Success
ID1000003_M1_C7
5.85946e-...
0.000 to 0.024 Amps
Success

Fig. 11

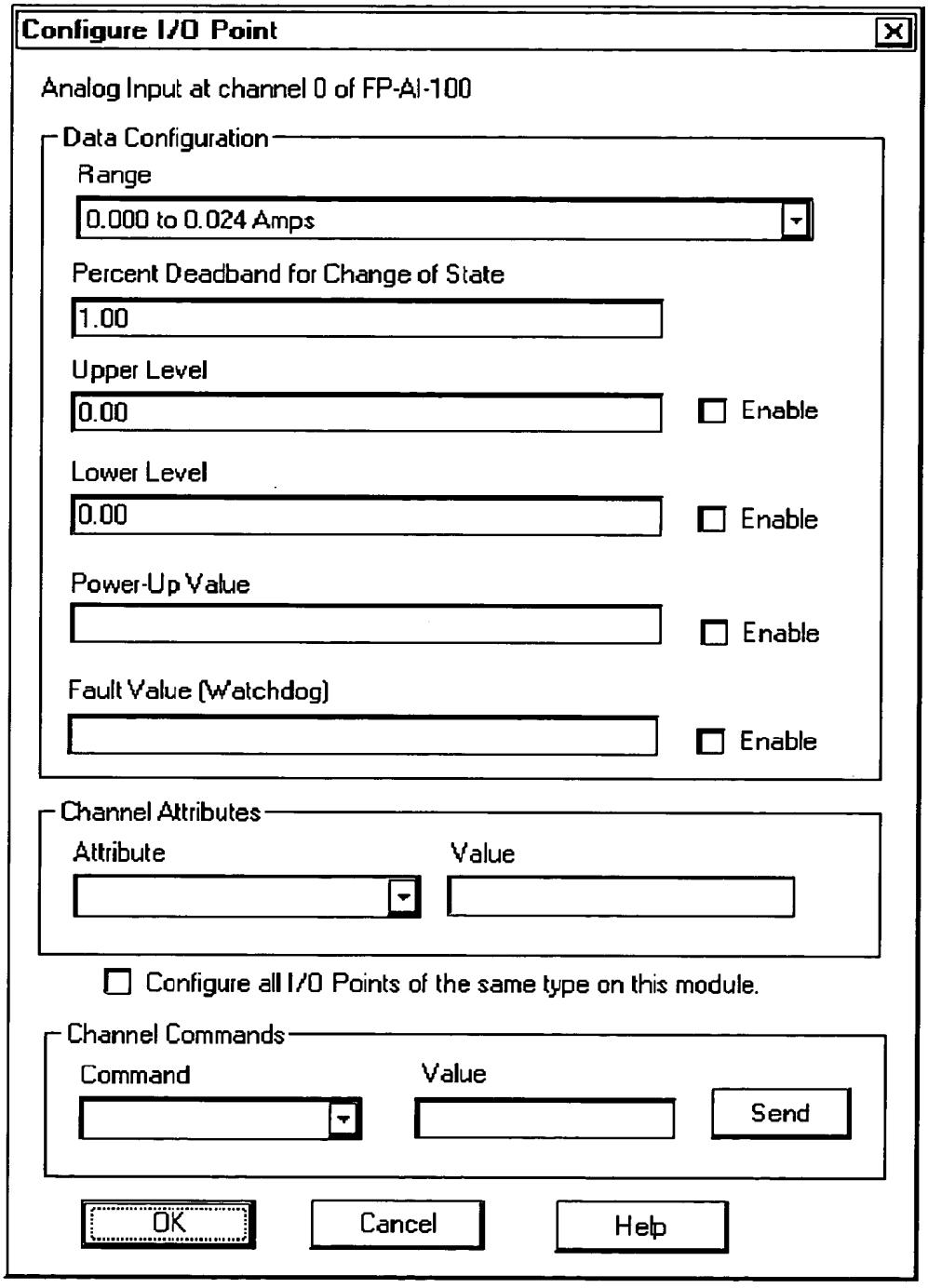

Configure I/O Point
Analog Input at channel 0 of FP-AI-100
Data Configuration
Range
0.000 to 0.024 Amps
Percent Deadband for Change of State
1.00
Upper Level
0.00
Enable
Lower Level
0.00
Enable
Power-Up Value
Enable
Fault Value (Watchdog)
Enable
Channel Attributes
Attribute
Value
Configure all I/O Points of the same type on this module.
Channel Commands
Command
Value
Send
OK
Cancel
Help

Fig. 12

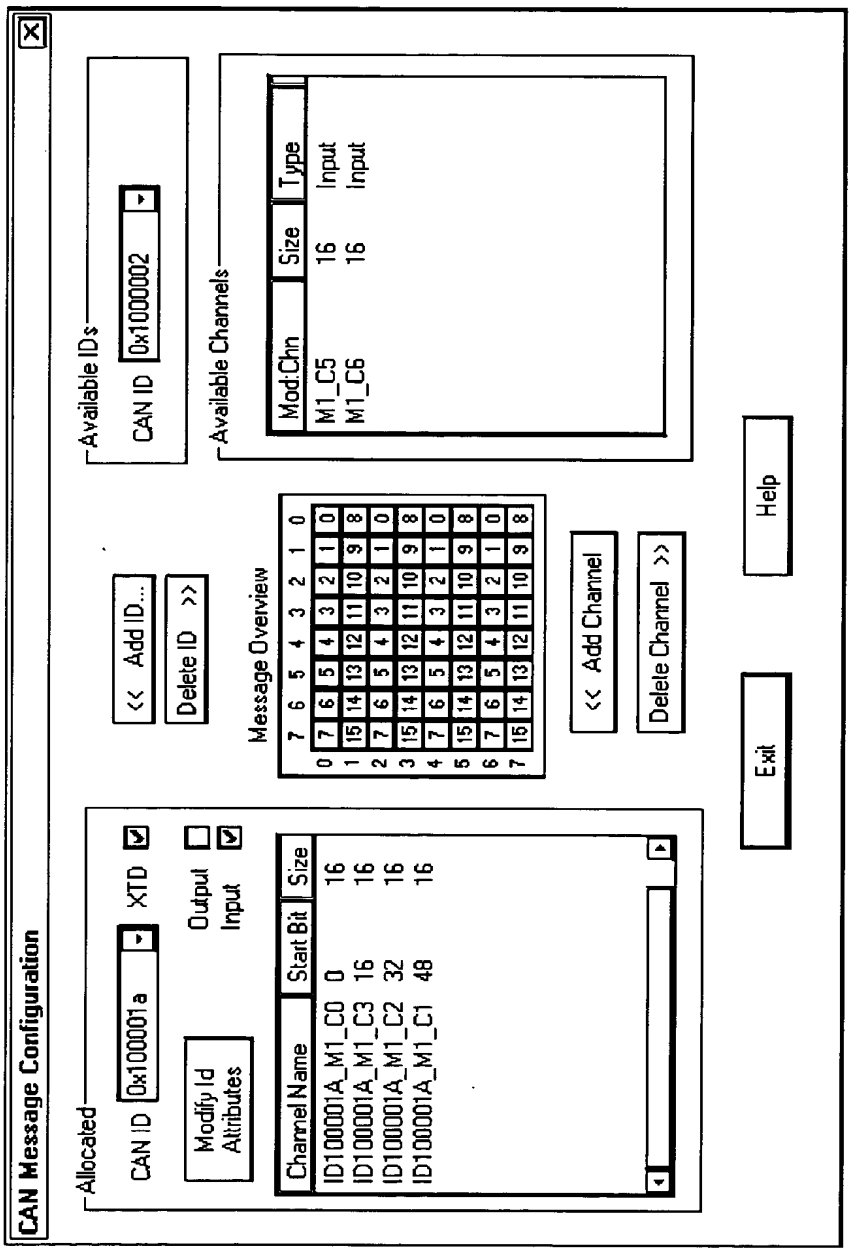

CAN Message Configuration
Allocated
CAN ID 0x100001a
XTD
Output
Input
Modify Id Attributes
Channel Name
Start Bit
Size
ID100001A_M1_C0 0 16
ID100001A_M1_C3 16 16
ID100001A_M1_C2 32 16
ID100001A_M1_C1 48 16
<< Add ID...
Delete ID >>
Message Overview
Available IDs
CAN ID 0x1000002
Available Channels
Mod:Chn
Size
Type
M1_C5 16 Input
M1_C6 16 Input
<< Add Channel
Delete Channel >>
Exit
Help

Fig. 13

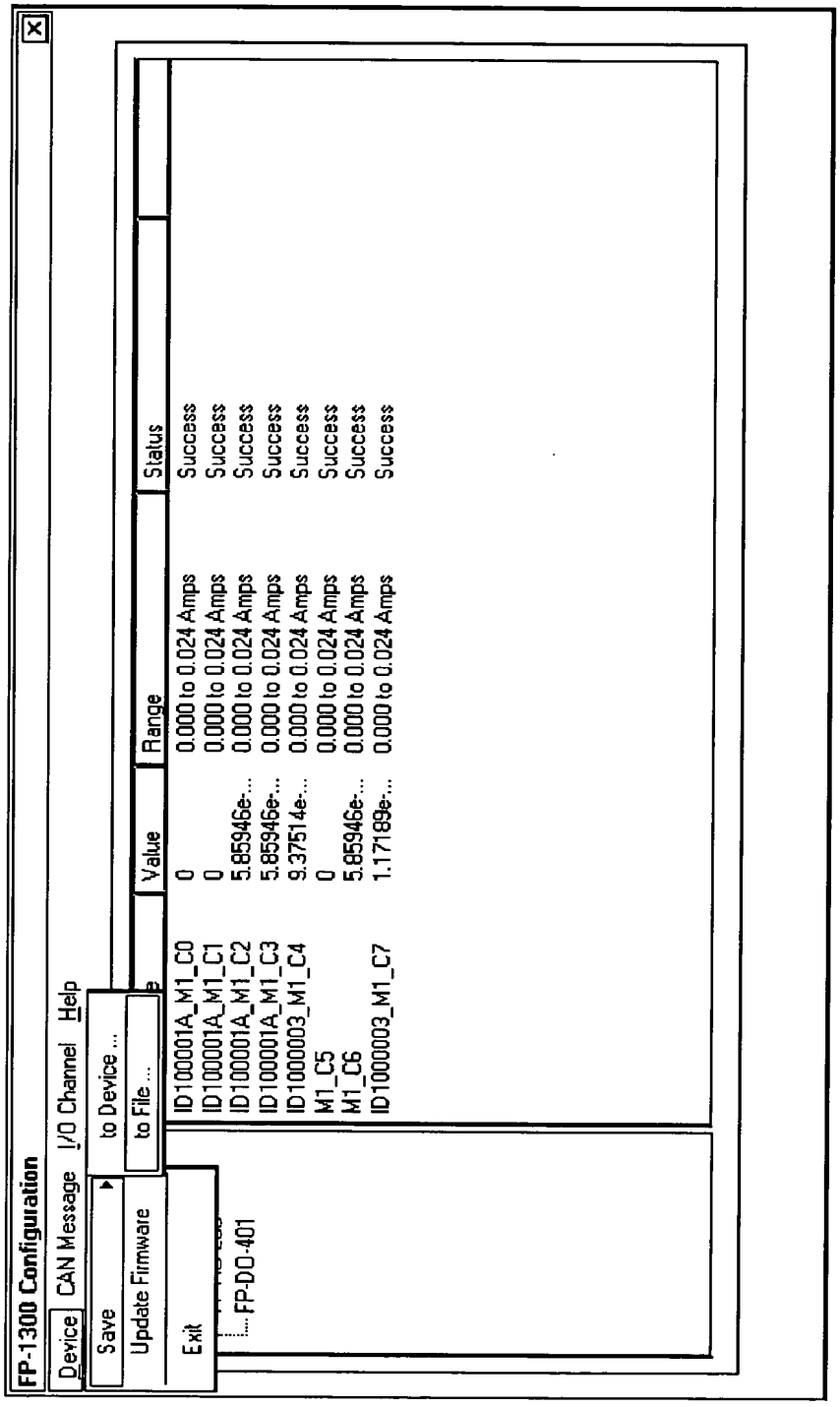

FP-1300 Configuration
Device
CAN Message
I/O Channel
Help
Save
to Device ...
Update Firmware
to File ...
Exit
FP-DO-401
Value
Range
Status
ID100001A_M1_C0
0
0.000 to 0.024 Amps
Success
ID100001A_M1_C1
0
0.000 to 0.024 Amps
Success
ID100001A_M1_C2
5.85946e-...
0.000 to 0.024 Amps
Success
ID100001A_M1_C3
5.85946e-...
0.000 to 0.024 Amps
Success
ID1000003_M1_C4
9.37514e-...
0.000 to 0.024 Amps
Success
M1_C5
0
0.000 to 0.024 Amps
Success
M1_C6
5.85946e-...
0.000 to 0.024 Amps
Success
ID1000003_M1_C7
1.17189e-...
0.000 to 0.024 Amps
Success

Fig. 14

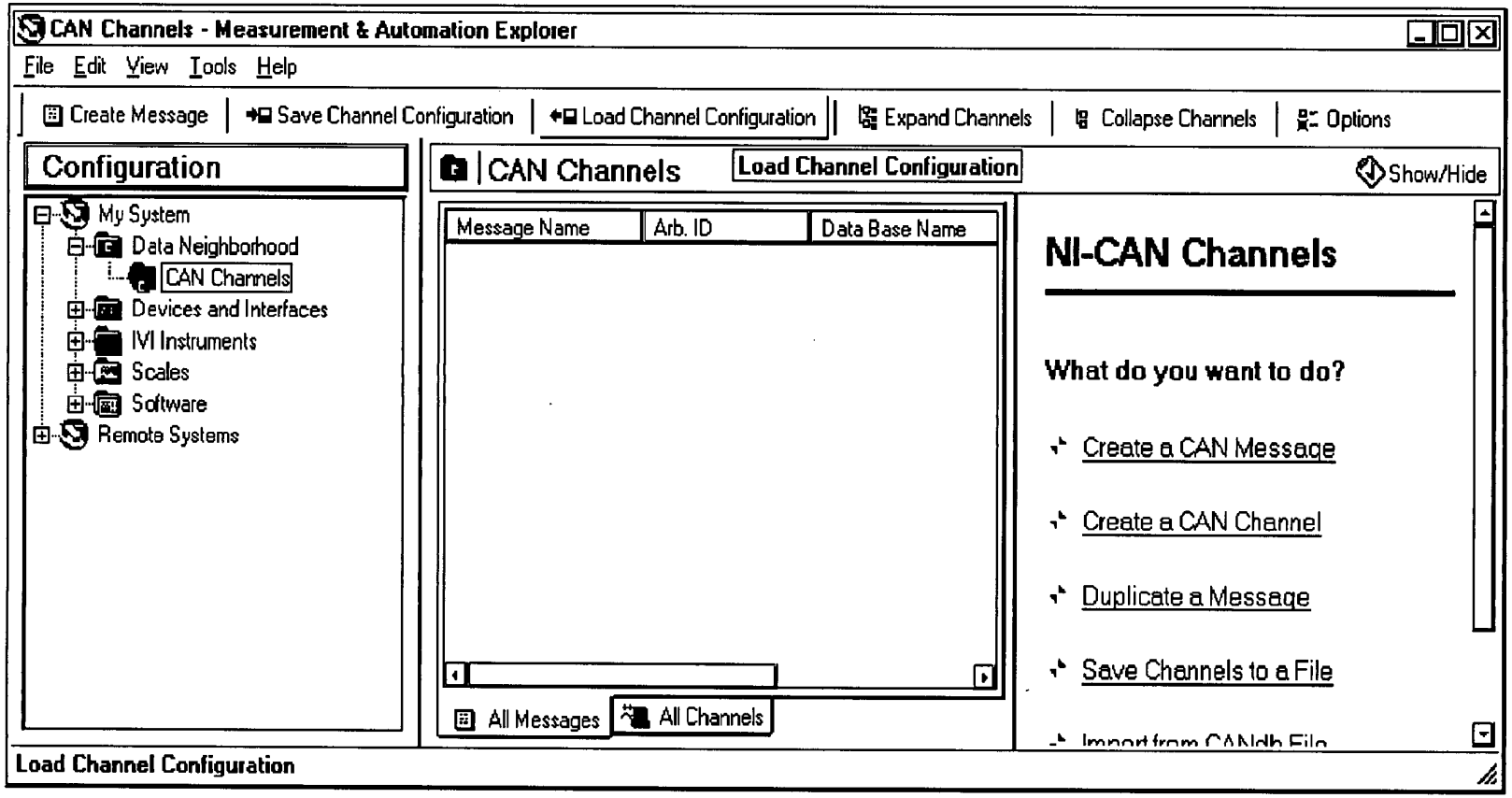

CAN Channels - Measurement & Automation Explorer
File Edit View Tools Help
Create Message
Save Channel Configuration
Load Channel Configuration
Expand Channels
Collapse Channels
Options
Configuration
My System
Data Neighborhood
CAN Channels
Devices and Interfaces
IVI Instruments
Scales
Software
Remote Systems
CAN Channels
Load Channel Configuration
Show/Hide
Message Name
Arb. ID
Data Base Name
All Messages
All Channels
NI-CAN Channels
What do you want to do?
Create a CAN Message
Create a CAN Channel
Duplicate a Message
Save Channels to a File
Load Channel Configuration

Fig. 15

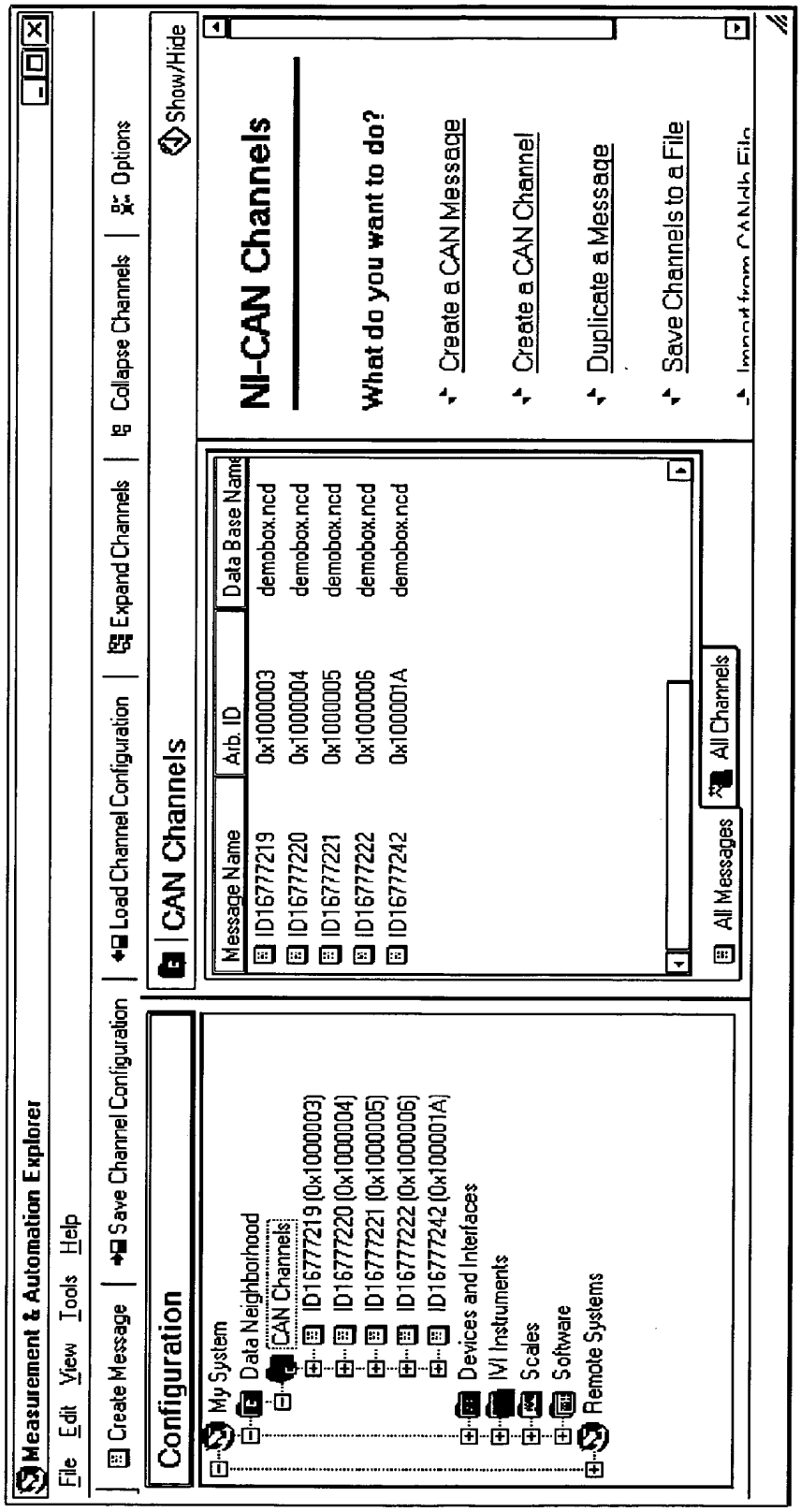

Measurement & Automation Explorer
File Edit View Tools Help
Create Message
Save Channel Configuration
Load Channel Configuration
Expand Channels
Collapse Channels
Options
Show/Hide
Configuration
My System
Data Neighborhood
CAN Channels
ID16777219 (0x1000003)
ID16777220 (0x1000004)
ID16777221 (0x1000005)
ID16777222 (0x1000006)
ID16777242 (0x100001A)
Devices and Interfaces
IVI Instruments
Scales
Software
Remote Systems
CAN Channels
Message Name
Arb. ID
Data Base Name
ID16777219 0x1000003 demobox.ncd
ID16777220 0x1000004 demobox.ncd
ID16777221 0x1000005 demobox.ncd
ID16777222 0x1000006 demobox.ncd
ID16777242 0x100001A demobox.ncd
All Messages
All Channels
NI-CAN Channels
What do you want to do?
Create a CAN Message
Create a CAN Channel
Duplicate a Message
Save Channels to a File

Fig. 16

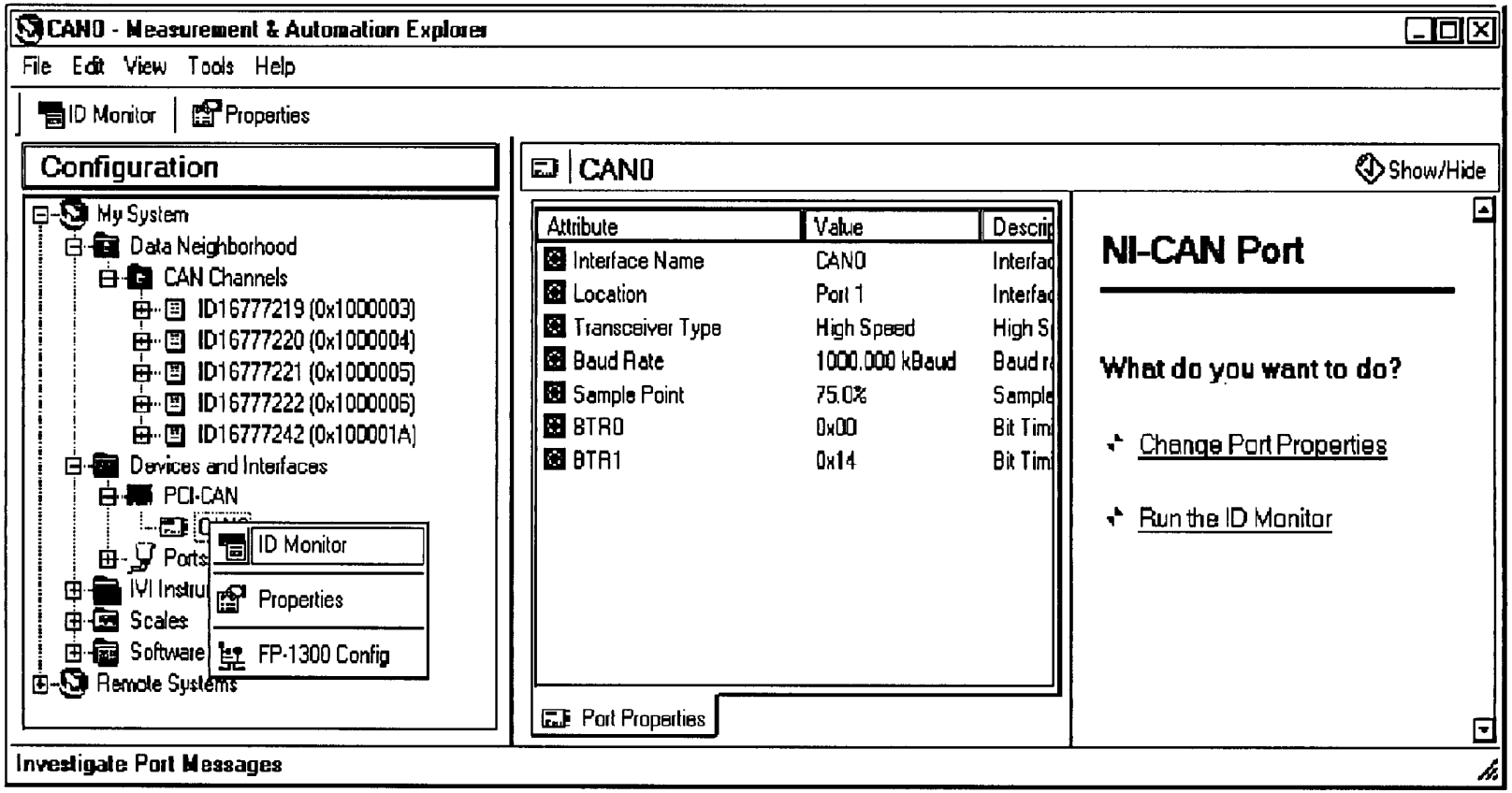

CAN0 - Measurement & Automation Explorer
File Edit View Tools Help
ID Monitor
Properties
Configuration
My System
Data Neighborhood
CAN Channels
ID16777219 (0x1000003)
ID16777220 (0x1000004)
ID16777221 (0x1000005)
ID16777222 (0x1000006)
ID16777242 (0x100001A)
Devices and Interfaces
PCI-CAN
Ports
IVI Instru
Scales
Software
Remote Systems
ID Monitor
Properties
FP-1300 Config
CAN0
Show/Hide
Attribute
Value
Interface Name
CAN0
Location
Port 1
Transceiver Type
High Speed
Baud Rate
1000.000 kBaud
Sample Point
75.0%
BTR0
0x00
BTR1
0x14
Port Properties
NI-CAN Port
What do you want to do?
Change Port Properties
Run the ID Monitor
Investigate Port Messages

Fig. 17

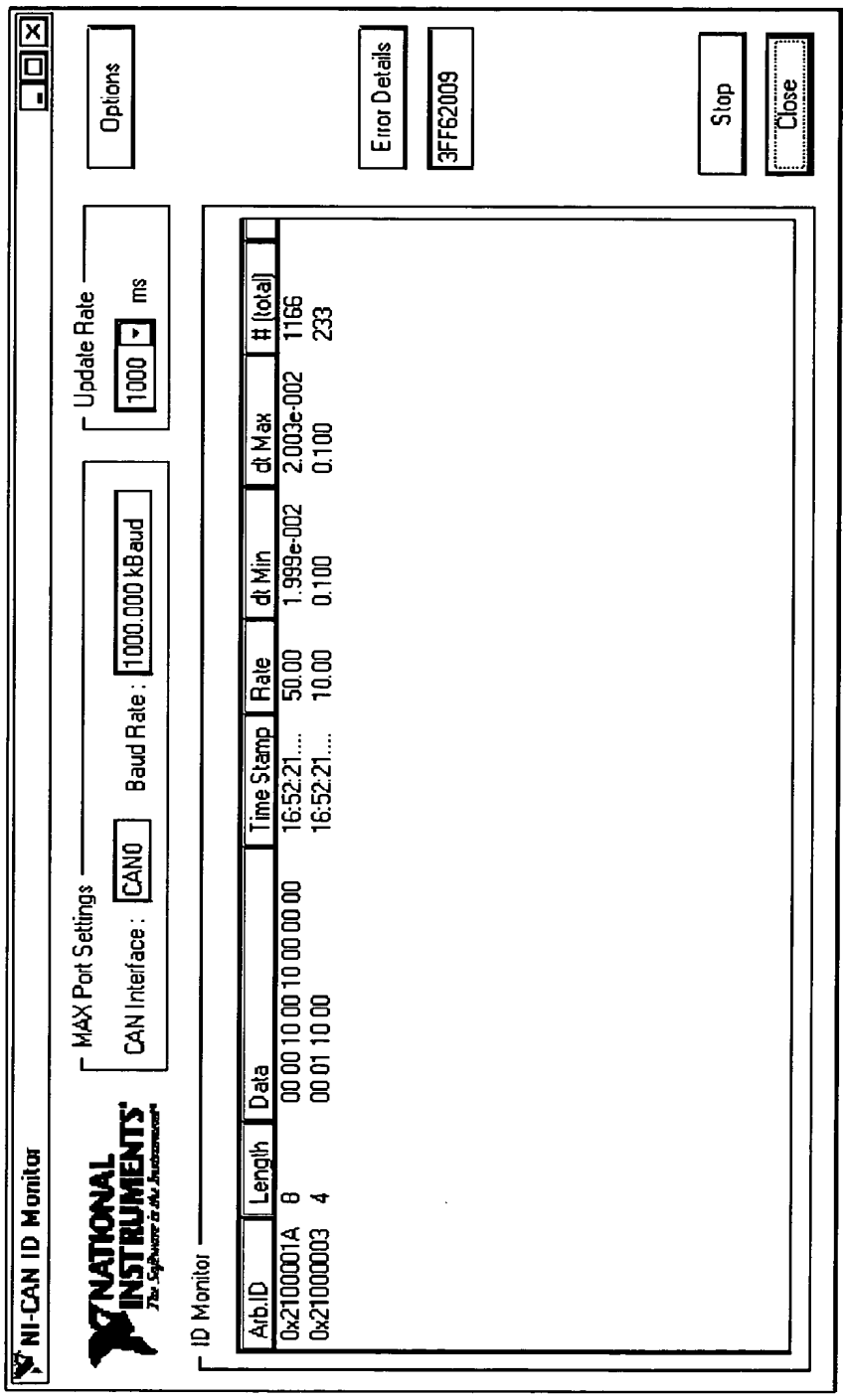

NI-CAN ID Monitor
NATIONAL INSTRUMENTS
MAX Port Settings
CAN Interface : CAN0
Baud Rate : 1000.000 kBaud
Update Rate
1000
ms
Options
ID Monitor
Arb.ID
Length
Data
Time Stamp
Rate
dt Min
dt Max
(total)
0x2100001A 8 00 00 10 00 10 00 00 00 16:52:21.... 50.00 1.999e-002 2.003e-002 1166
0x21000003 4 00 01 10 00 16:52:21.... 10.00 0.100 0.100 233
Error Details
3FF62009
Stop
Close

Fig. 18

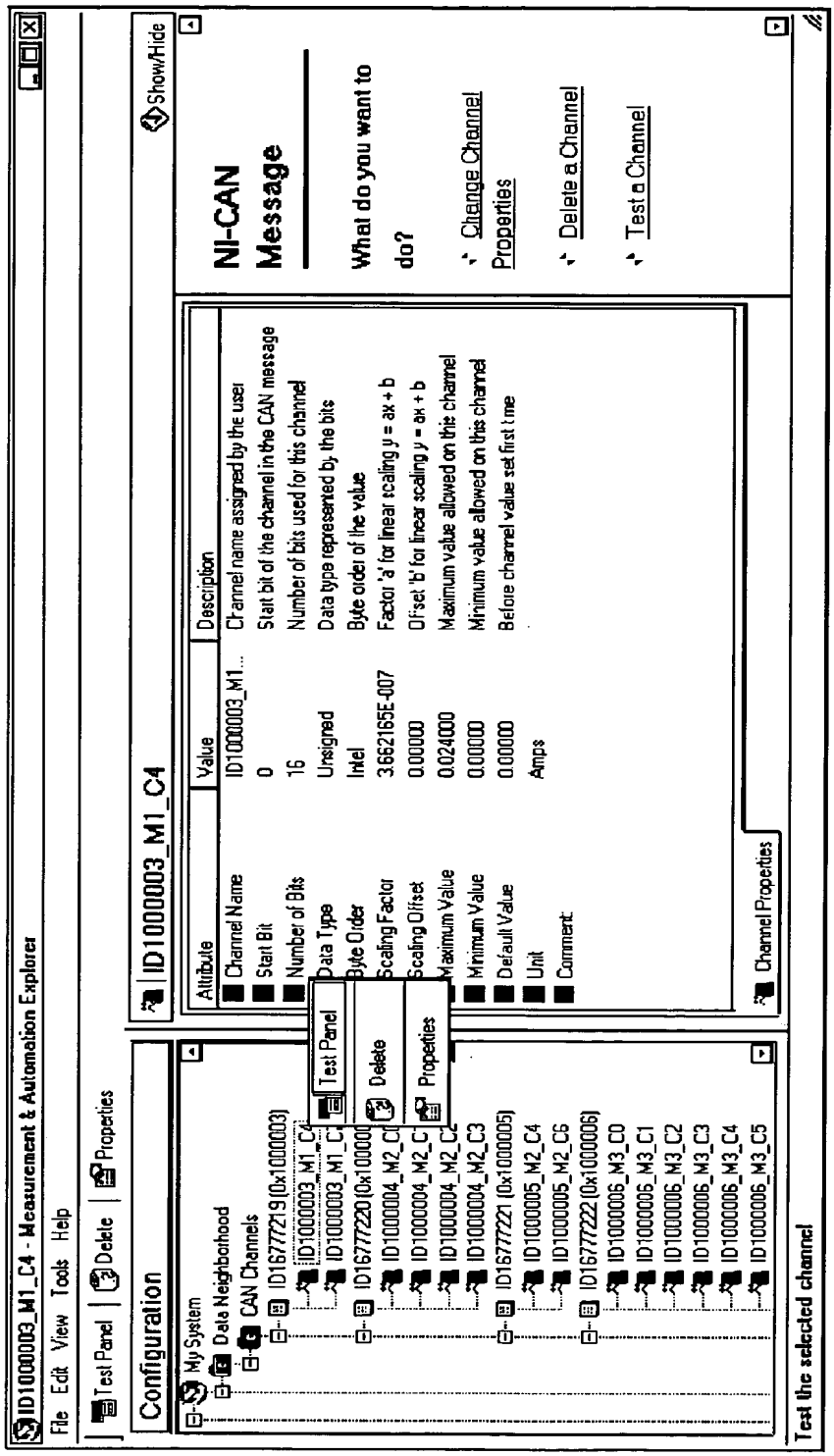

ID1000003_M1_C4 - Measurement & Automation Explorer
File Edit View Tools Help
Test Panel
Delete
Properties
Configuration
My System
Data Neighborhood
CAN Channels
ID16777219 (0x1000003)
ID1000003_M1_C4
ID1000003_M1_C3
ID16777220 (0x1000004)
ID1000004_M2_C0
ID1000004_M2_C1
ID1000004_M2_C2
ID1000004_M2_C3
ID16777221 (0x1000005)
ID1000005_M2_C4
ID1000005_M2_C5
ID16777222 (0x1000006)
ID1000006_M3_C0
ID1000006_M3_C1
ID1000006_M3_C2
ID1000006_M3_C3
ID1000006_M3_C4
ID1000006_M3_C5
Test Panel
Delete
Properties
ID1000003_M1_C4
Show/Hide
Attribute
Value
Description
Channel Name
ID1000003_M1...
Channel name assigned by the user
Start Bit
0
Start bit of the channel in the CAN message
Number of Bits
16
Number of bits used for this channel
Data Type
Unsigned
Data type represented by the bits
Byte Order
Intel
Byte order of the value
Scaling Factor
3.6621655E-007
Factor 'a' for linear scaling y = ax + b
Scaling Offset
0.00000
Offset 'b' for linear scaling y = ax + b
Maximum Value
0.024000
Maximum value allowed on this channel
Minimum Value
0.00000
Minimum value allowed on this channel
Default Value
0.00000
Before channel value set first time
Unit
Amps
Comment
Channel Properties
NI-CAN Message
What do you want to do?
Change Channel Properties
Delete a Channel
Test a Channel
Test the selected channel

Fig. 19

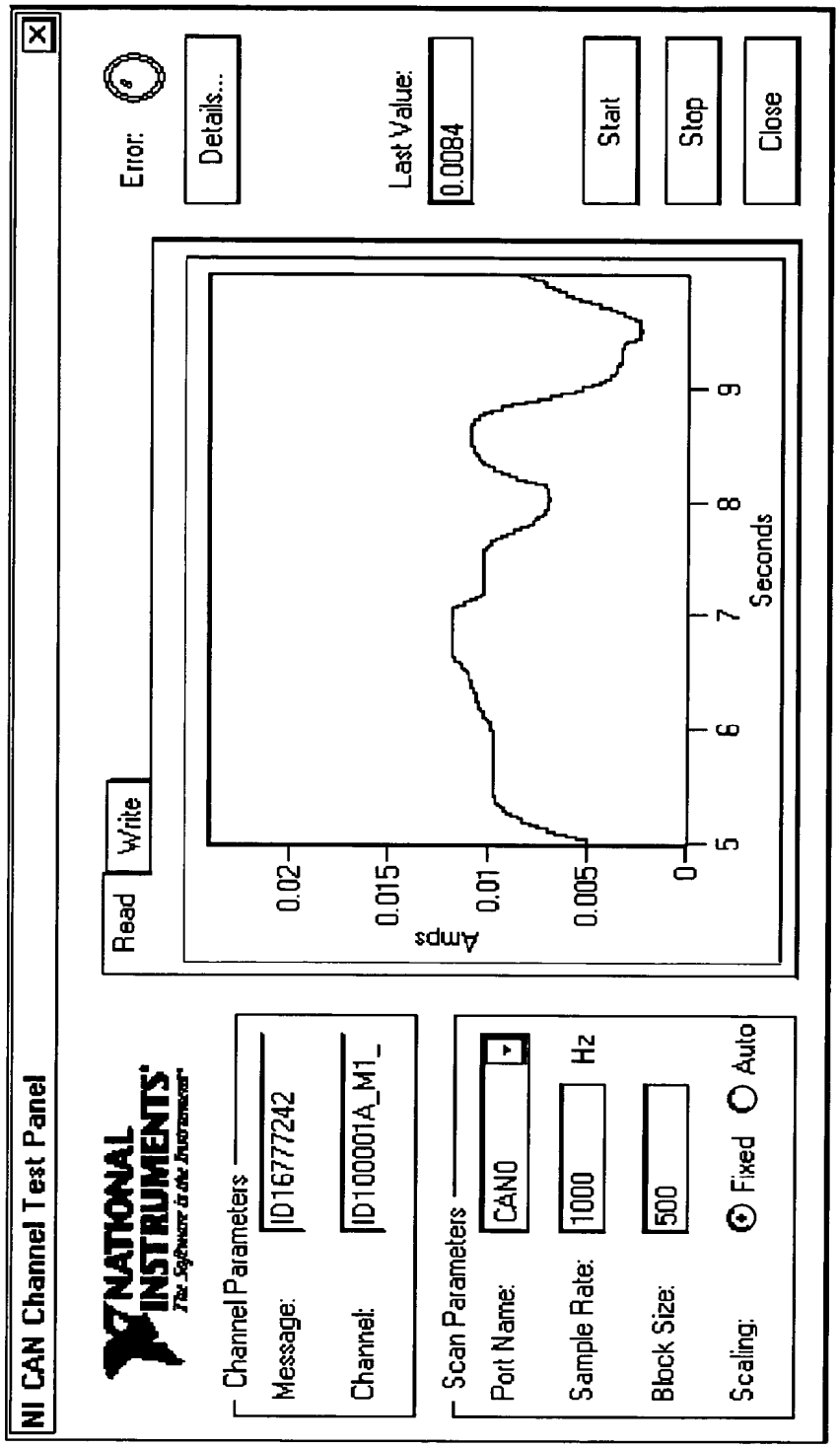

NI CAN Channel Test Panel
NATIONAL INSTRUMENTS
Channel Parameters
Message:
ID16777242
Channel:
ID100001A_M1_
Scan Parameters
Port Name:
CAN0
Sample Rate:
1000
Hz
Block Size:
500
Scaling:
Fixed
Auto
Read
Write
Error:
Details...
Last Value:
0.0084
Start
Stop
Close
Amps
0.02
0.015
0.01
0.005
0
5
6
7
8
9
Seconds

Fig. 20

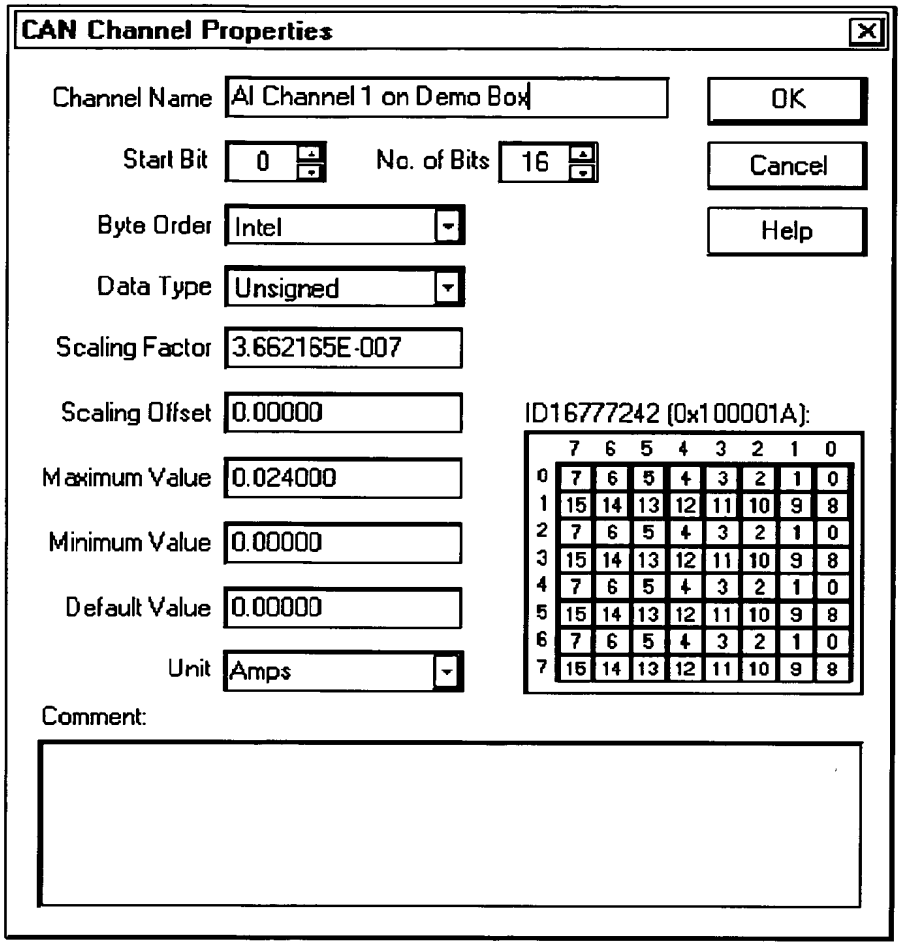

CAN Channel Properties
Channel Name
AI Channel 1 on Demo Box
OK
Start Bit
0
No. of Bits
16
Cancel
Byte Order
Intel
Help
Data Type
Unsigned
Scaling Factor
3.662165E-007
Scaling Offset
0.00000
ID16777242 (0x100001A):
Maximum Value
0.024000
Minimum Value
0.00000
Default Value
0.00000
Unit
Amps
Comment:
7 6 5 4 3 2 1 0
0 7 6 5 4 3 2 1 0
1 15 14 13 12 11 10 9 8
2 7 6 5 4 3 2 1 0
3 15 14 13 12 11 10 9 8
4 7 6 5 4 3 2 1 0
5 15 14 13 12 11 10 9 8
6 7 6 5 4 3 2 1 0
7 15 14 13 12 11 10 9 8

Fig. 21

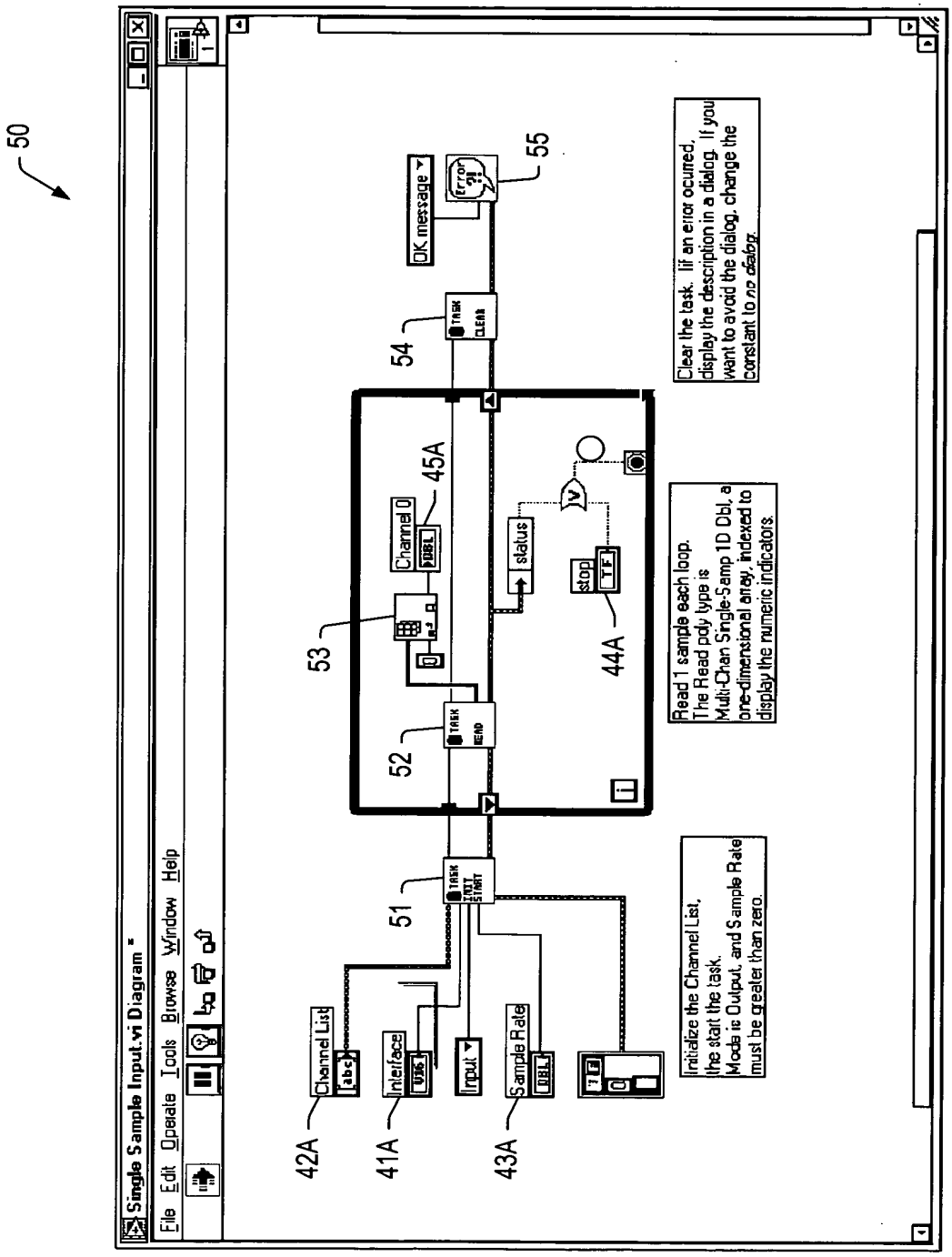

50
Single Sample Input.vi Diagram
File Edit Operate Tools Browse Window Help
Channel List
Interface
Input
Sample Rate
42A
41A
43A
51
52
53
54
55
45A
44A
Channel 0
status
stop
OK message
Initialize the Channel List, the start the task. Mode is Output, and Sample Rate must be greater than zero.
Read 1 sample each loop. The Read poly type is Multi-Chan Single-Samp 1D Dbl, a one-dimensional array, indexed to display the numeric indicators.
Clear the task. If an error ocurred, display the description in a dialog. If you want to avoid the dialog, change the constant to no dialog.

Fig. 22

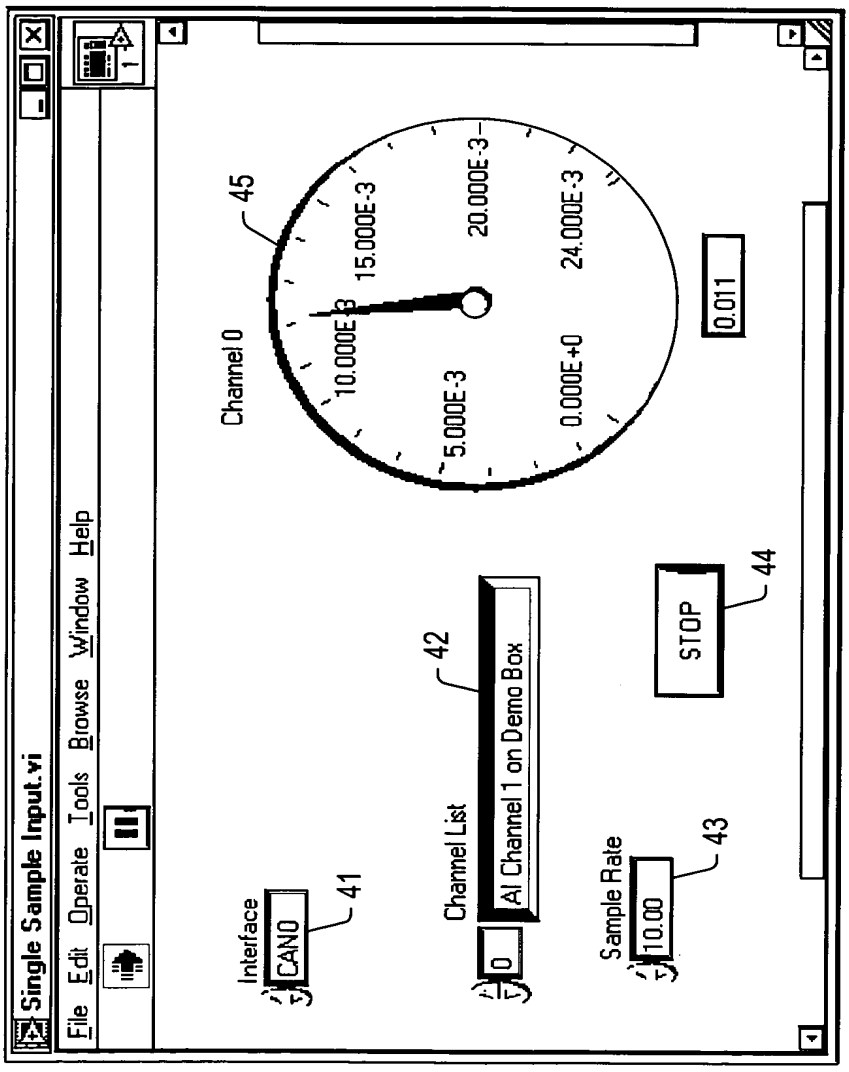

40
Single Sample Input.vi
File Edit Operate Tools Browse Window Help
Channel 0
45
10.000E-3
15.000E-3
20.000E-3
5.000E-3
0.000E+0
24.000E-3
0.011
Interface
CAN0
41
Channel List
0
42
AI Channel 1 on Demo Box
Sample Rate
10.00
43
STOP
44

Fig. 23